

# Shoulder Pain

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*"Topics in Primary Care Medicine" presents articles on common diagnostic or therapeutic problems (such as dizziness, pruritus, insomnia, shoulder pain and urinary tract infections) encountered in primary care practice that generally do not fall into well-defined subspecialty areas and are rarely discussed thoroughly in medical school, house staff training, textbooks and journals. Often the pathophysiology is poorly understood and clinical trials to assess the effectiveness of diagnostic tests or therapies may be lacking. Nevertheless, these problems confront practitioners with practical management questions.*

*The articles in this series discuss new tests and therapies and suggest reasonable approaches even when definitive studies are not available. Each article has several general references for suggested further reading. We hope this new series will be of interest and we welcome comments, criticisms and suggestions.*

—BERNARD LO, MD  
STEPHEN J. McPHEE, MD  
Series Editors

PRIMARY CARE PHYSICIANS frequently see patients who have pain and loss of normal motion in the shoulder. It is gratifying for a clinician to evaluate this condition because, in most cases, a carefully elicited history and a physical examination are all that are necessary to arrive at a diagnosis. This discussion will review the important functional anatomy of the shoulder, outline an approach to the care of a patient who has symptoms confined to the shoulder and describe the clinical features of the most common syndromes. Several excellent reviews of shoulder pain have been published recently for those who desire a more detailed discussion (see "General References").

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The complex motion of the shoulder is the result of movements of four joints: the glenohumeral, the acromioclavicular (AC), the sternoclavicular and the scapulothoracic. Coordinated movement of each of these joints occurs during complex shoulder maneuvers like throwing, so that derangements affecting any of these joints may result in abnormal shoulder motion. Restricted motion of one joint usually causes an alteration in the normal motion of the other shoulder joints.

A variety of disorders, including cervical spine disease, neurologic dysfunction, thoracic outlet syndrome(s), systemic arthritis and neoplasm, may produce pain in the vicinity of the shoulder either by direct involvement or via referred pain mechanisms. The most common causes of shoul-

der pain and their important clinical features are listed in Table 1.

### Anatomy of the Shoulder Joint

Pain that is felt "in" the shoulder joint is usually due to processes affecting the glenohumeral joint, the AC joint or the soft tissues of the shoulder, which include the joint capsule, supporting ligaments, the rotator cuff and the long head of the biceps tendon. Important anatomic relationships are depicted in Figure 1. Note that the long head of the biceps tendon, which originates on the superior rim of the glenoid, passes down the anterior aspect of the humerus in a groove between the greater and lesser tuberosities. The acromion and the coracoacromial ligaments provide a roof over the humeral head and the rotator cuff tendons.

The points of insertion of the rotator cuff tendons and the location of the subacromial bursa are shown in Figure 2. This bursa, which occa-

sionally is referred to as the subdeltoid or supraspinatus bursa, lies directly under the acromion and the deltoid muscle immediately above the tendons of the rotator cuff and the humeral head. When inflammation develops in the tendons, the overlying bursa frequently becomes inflamed also.

### History and Examination

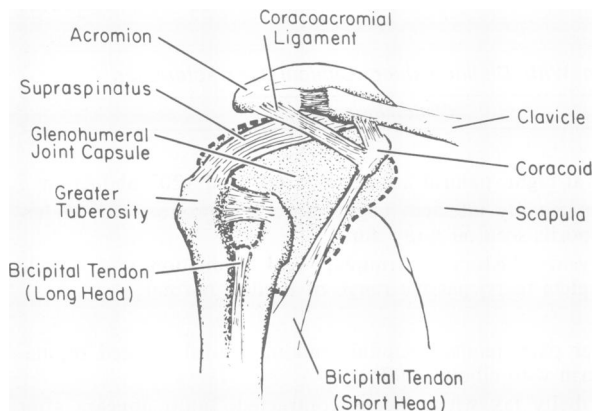
Important information to elicit from a patient having shoulder pain includes a history of recent or remote shoulder trauma or excessive occupational stress, the presence of associated symptoms suggesting a systemic or neurologic disorder, the exact location and duration of the pain and factors that increase or diminish the pain. Pain in the region of the AC joint suggests a local problem, whereas pain over the anterior or lateral aspect of the humerus suggests a biceps tendon or rotator cuff problem. Pain extending from the acromion to the lower part of the deltoid generally reflects deep inflammation in the rotator cuff tendons.

TABLE 1.—*Differential Diagnosis of Shoulder Pain With Distinguishing Clinical Characteristics*

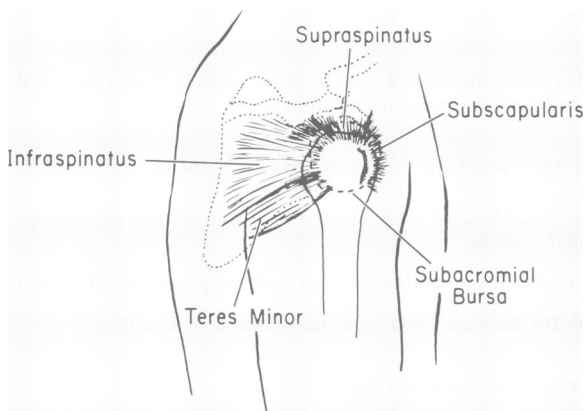
<i>Diagnoses</i>	<i>Clinical Features</i>
<b>Rotator cuff lesions</b>	
Degenerative tendinitis or bursitis . . . . .	Dull pain worse at night; painful arc between 60° and 120° abduction
Calcific tendinitis or bursitis . . . . .	Men and women equally affected; begins abruptly; pronounced tenderness; calcium deposits seen on x-ray films
Rotator cuff tears, partial or complete . . .	Older than 50 years; history of trauma; weak abduction and muscle spasm with complete tears; passive range of motion normal
<b>Biceps tendon lesions</b>	
Tendinitis, tenosynovitis . . . . .	Anterior shoulder pain; tender bicipital tendon; painful resisted supination of the forearm with elbow at 90°
Elongation or rupture . . . . .	Weakness; long belly lax when biceps contracted; lump appears after rupture
Dislocation . . . . .	Painful external rotation with snap, relieved by medial rotation
<b>Adhesive capsulitis or "frozen shoulder" . . .</b>	Diffuse pain and tenderness, reduced active and passive motion; no improvement in motion after injecting local anesthetic; arthrogram shows contracted capsule
Primary (idiopathic)	
Due to immobilization following injury, tendinitis, bursitis	
<b>Reflex sympathetic dystrophy . . . . .</b>	Similar to adhesive capsulitis along with pain, swelling, tenderness and skin changes in the hand; vasomotor instability
<b>Osteoarthritis</b>	
Acromioclavicular joint . . . . .	Painful abduction 140° to 180°; shrugging motion painful; local tenderness
Glenohumeral joint . . . . .	Following trauma or associated with calcium pyrophosphate deposition; mild pain; restricted motion
<b>Trauma, including nerve injuries . . . . .</b>	History, findings on physical examination and radiographs make diagnosis
<b>Septic arthritis . . . . .</b>	Joint effusion; painful motion; fever; elevated leukocyte count
<b>Systemic diseases including the arthritides and metabolic-endocrine disorders . . . . .</b>	Signs and symptoms of systemic process
<b>Other musculoskeletal disorders such as fibromyalgia and polymyalgia rheumatica (PMR) .</b>	Pain and stiffness more generalized and symmetric; painful trigger points with fibromyalgia; age older than 50 years with high sedimentation rate in PMR

When inflammation persists for many months the pain may radiate down the arm as far as the wrist, in the distribution of the C5 dermatome.

A complete physical examination should include careful examination of the cervical spine, a detailed neurologic examination and a thorough examination of the affected extremity. The shoulder should first be carefully inspected for atrophy, fasciculations, swelling or erythema. Palpation of the AC joint may elicit moderate tenderness following an injury or when advanced degenerative arthritis is present. A glenohumeral joint effusion is best felt just lateral to the coracoid process, which should be easily identified anteriorly. With the arm in external rotation (palms forward) the anterior aspect of the humerus should be gently palpated with the thumb. The long head of the biceps tendon can usually be felt in the intertubercular groove just medial to the prominent



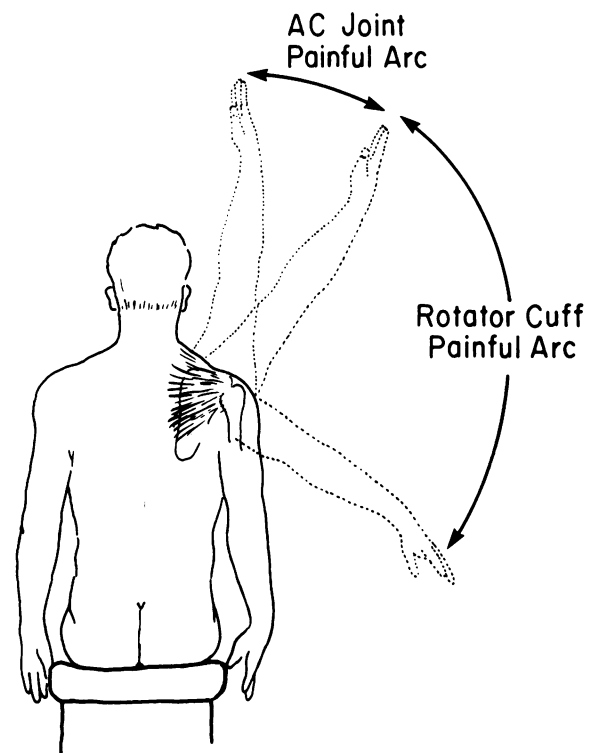
**Figure 1.**—Anterior view of the shoulder showing the joint capsule and important surrounding structures.



**Figure 2.**—Lateral view of the shoulder showing the points of insertion of the rotator cuff and the location of the subacromial bursa.

anterior aspect of the greater tuberosity. Whereas palpation may elicit moderate tenderness in many normal persons, exquisite tenderness is noted in patients with bicipital tendinitis. The greater tuberosity should be examined next. Maximal tenderness in this region suggests supraspinatus tendinitis, bursitis or a supraspinatus tendon tear. Tenderness over the posterior aspect of the greater tuberosity suggests inflammation in the infraspinatus or teres minor tendon.

Next, range of shoulder motion must be observed and carefully noted. In most cases assessment of active range of motion using five maneuvers will yield the essential information. First, ask a patient to lift both arms away from the body and reach as high above the head as possible (abduction, see Figure 3). Second, have the patient raise both arms directly forward until they touch overhead (flexion). Third, have the patient place one hand and then the other behind the back and touch as high on the back as possible (internal rotation). Fourth, with the elbows flexed



**Figure 3.**—Abduction of the shoulder. Pain arising from rotator cuff tendinitis or bursitis causes pain between 60 degrees and 100 to 120 degrees whereas AC joint inflammation causes pain between 140 degrees and 180 degrees. Pain due to rotator cuff tendinitis may disappear when the arm is abducted above 100 degrees to 120 degrees.

at 90 degrees and held against the body, have the patient turn the arms out (external rotation). Fifth, ask the patient to actively shrug and protrude the shoulders to test the sternoclavicular and the AC joints. Motion against resistance during each of these maneuvers may be extremely useful in eliciting pain and thereby identifying inflamed tissues, especially when shoulder pain is mild. Finally, after measuring active range of motion, a physician should test passive range of motion, particularly abduction, flexion and external rotation.

Although one can frequently diagnose the cause of shoulder pain clinically, plain radiographs are useful in showing calcific deposits in the rotator cuff tendons, calcium pyrophosphate deposition in the articular cartilage and primary or secondary degenerative changes in the humeral head, the AC joint and the glenohumeral joint. Arthrography is very helpful in diagnosing complete rotator cuff tears and adhesive capsulitis.

### Major Clinical Syndromes

#### *Rotator Cuff Tendinitis and Bursitis*

Inflammation occurs frequently in the tendons of the rotator cuff, particularly in the supraspinatus tendon, as a result of repeated occupational or recreational trauma to the shoulder. Bursitis arises due to inflammation of the rotator cuff tendons. Patients are usually middle-aged and have a dull ache in the region of the deltoid, worsened by sleeping on that side or raising their arm in abduction. With the arm at the side in external rotation, tenderness may be elicited anteriorly (subscapularis or biceps), over the greater tuberosity (supraspinatus) or more posteriorly (infraspinatus). Active abduction usually brings on severe pain between 60 degrees and 100 to 120 degrees of abduction—called “the painful arc”—when the inflamed rotator cuff and the overlying bursa are forced under the acromion and coracoacromial ligament. Patients are usually unable to abduct the arm beyond 60 degrees without initiating scapular motion with a shrug to lift the arm higher. If the arm can be abducted beyond 100 degrees to 120 degrees the intensity of the pain may decrease considerably. Passive range of motion is usually close to normal but may be restricted because of pain. Infiltration of the region of the rotator cuff with 2 ml of 1 percent lidocaine solution usually relieves the pain and allows full range of motion. In most cases findings on radiographs are normal, but secondary degenerative

changes may be seen in the greater tuberosity, the AC joint and the undersurface of the acromion, particularly in patients with chronic shoulder pain.

Treatment to help relieve pain usually consists of support of the shoulder in a sling for several days, use of nonsteroidal antiinflammatory agents such as aspirin or indomethacin and physical therapies such as ultrasound and local application of heat or cold packs. A simple physical therapy program should be initiated as soon as possible with the aim of preserving full range of motion and preventing adhesive capsulitis or a reflex sympathetic dystrophy. Full immobilization of the shoulder should be avoided. If a physical therapist is not available, family members should be taught how to assist the patient in gentle passive range of motion exercises, which should be done several times each day. Pendulum exercises are the next step, in which a patient is instructed to lean forward and slowly swing the dangling arm back and forth, first in the plane across the front of the body and then along the side for ten minutes three times a day, gradually increasing the amplitude of each swing as tolerated. The use of a light 3- to 5-lb (1.4 to 2.3 kg) weight in the hand may help to stretch the tissues in the shoulder. If pain and restricted motion persist, injection of a mixture of 1 ml of 1 percent lidocaine and 20 to 40 mg of methylprednisolone acetate (the crystalline form of the steroid) or its equivalent into the bursa adjacent to the involved tendon may provide long-term relief. Preventive measures include reduction of recreational or work-related shoulder stress and, in selected cases, surgical intervention to relieve chronic rotator cuff impingement.

#### *Calcific Tendinitis and Bursitis*

Radiographically evident calcium deposition (hydroxyapatite) develops in the tendons of the rotator cuff in as many as 8 percent of persons over 30 years of age. The pathogenesis of the calcium deposition is unknown but the process is frequently bilateral and usually asymptomatic. In patients with clinical evidence of rotator cuff tendinitis, the radiographic finding of tendon calcification may be a marker for a degenerative process occurring in these tendons. In some persons, however, the calcium deposits may enlarge and spontaneously rupture into the overlying subacromial bursa, producing an acute, extremely painful, crystal-induced bursitis. The clinical

presentation is dramatic. Marked spasm develops in the shoulder muscles and a patient will hold the elbow tightly against the side to splint any motion. Gentle palpation of the shoulder elicits exquisite tenderness and findings on x-ray films show an oval deposit of calcium between the humeral head and the acromion.

Treatment of an acutely inflamed shoulder includes sling support, liberal use of analgesic medications and prompt injection of 2 ml of 1 percent lidocaine mixed with 40 mg of methylprednisolone acetate or its equivalent into the tendon sheath adjacent to the calcific deposit, followed by a program of gradual shoulder mobilization. If symptoms do not subside in several weeks, the region should be reinjected with an anesthetic and steroid mixture and, after anesthesia has been attained, the calcific mass should be probed with a needle several times in an attempt to free calcium crystals. The long-term prognosis is very good.

#### *Rotator Cuff Tears*

Complete rotator cuff tears rarely occur in young persons, but this condition is commonly seen in persons older than 50 years. Classically, in a patient who has had a long history of excessive shoulder use, pain suddenly develops during lifting or after falling. Shoulder pain intensifies about 12 hours later and a patient is unable to abduct the affected arm. On examination severe muscle spasm and normal *passive* range of motion to at least 90 degrees of abduction will be seen. An important sign is frankly weak abduction, as evidenced by the inability to hold the arm at 90 degrees without support or collapse of the abducted arm when minimal downward pressure is applied by the examiner (drop arm sign). Downward traction on the arm or dangling the arm like a pendulum may help to relieve the pain. Arthrography may establish the diagnosis by showing direct continuity between the glenohumeral joint and the subacromial bursa. Arthrography should be done immediately in any patient suspected of sustaining a complete rotator cuff tear who is an appropriate candidate for surgical treatment and, if a tear is present, the patient should be referred to an orthopedic surgeon. Partial tears are difficult to diagnose clinically because signs and symptoms of partial tears mimic rotator cuff tendinitis. Partial tears may be managed conservatively.

#### *Bicipital Syndromes*

Inflammation confined to the tendon of the long head of the biceps generally occurs in persons who stress this tendon by repetitive motion of the arm using a pulling or throwing motion. Extreme tenderness is noted when the tendon is palpated in the bicipital groove. With the arm externally rotated and extended at the elbow, flexion of the shoulder against resistance produces pain. Forced supination of the forearm with the elbow flexed at 90 degrees also causes pain in the long head of the biceps tendon. Some patients feel a painful "snap" when they externally rotate and abduct the shoulder, and palpation may find the tendon slipping out of the bicipital groove. A painful arc during flexion or abduction suggests that rotator cuff inflammation is also present.

Treatment of bicipital tendinitis includes discontinuation or alteration of the repetitive shoulder motion responsible for the irritation, use of nonsteroidal antiinflammatory agents and, on occasion, local injection of 20 mg of methylprednisolone acetate or its equivalent into the tendon sheath. Repeated injections of corticosteroid may weaken the tendon and lead to eventual rupture. Surgical therapy is indicated for a dislocating tendon and chronic bicipital tendinitis unresponsive to medical therapy.

#### *Adhesive Capsulitis*

The terms adhesive capsulitis and "frozen shoulder" refer to a disorder characterized by the gradual onset of diffuse shoulder tenderness together with greatly reduced active *and* passive range of motion that does not improve following the instillation of a local anesthetic adjacent to the rotator cuff. The pathogenesis is unknown, but it usually develops after prolonged immobilization of the shoulder and has been reported in patients with shoulder trauma, rotator cuff tendinitis, cervical spine disease and rheumatoid arthritis. The normally voluminous joint capsule becomes contracted and fibrotic. There is speculation that this condition may be a limited form of a reflex sympathetic dystrophy.

On physical examination there is diffuse shoulder tenderness and reduced range of motion in all planes. Radiographs frequently show osteopenia of the humeral head. Arthrography may be diagnostic because in essentially all cases there is a frankly contracted joint capsule with loss of

bursal outpouchings. The disorder may last for several years and be characterized by an initial period of increasing pain and stiffness followed by a period of restricted motion with diminished pain followed by a gradual return of motion with abatement of pain.

The best treatment is prevention with early rehabilitation of any painful or immobilized shoulder using range of motion exercises and physical therapy. Although no controlled studies have been reported, a variety of therapies have been advocated including intensive physical therapy, oral administration of corticosteroids in the early phases and injection of approximately 50 ml of saline mixed with a local anesthetic and the equivalent of 40 mg of methylprednisolone acetate into the joint under pressure, a procedure called infiltration brisement.

#### *Reflex Sympathetic Dystrophy*

Reflex sympathetic dystrophy, also known as Sudeck's atrophy or the shoulder-hand syndrome, is a poorly understood disorder that is frequently associated with pain and restricted motion in the ipsilateral shoulder. Certain unique clinical features easily differentiate reflex sympathetic dystrophy from other causes of shoulder pain. In addition to shoulder pain that mimics adhesive capsulitis, a patient will have moderate to severe burning pain, swelling and pronounced tenderness of the fingers and hand and signs of vasomotor instability in the arm such as hyperhidrosis, vasoconstriction and vasodilation. Trophic skin changes may subsequently develop, including atrophy, scaling, nail changes and contracture of the fascia. Radiographs usually show extensive osteopenia.

The pathogenesis is unknown but may relate to neuroregulatory dysfunction in the autonomic innervation to the arm. Predisposing conditions include age older than 50 years, immobilization following trauma or myocardial infarction, neurologic disorder such as stroke, brain abscess and spinal cord lesions and, interestingly, pulmonary tuberculosis and the use of isoniazid. Although treatment is controversial, the mainstays of therapy are adequate analgesia and intensive physical therapy as soon as possible to preserve function and motion. A short course of prednisone taken orally, starting with 30 or 40 mg twice a day

and tapering over four to six weeks, appears to be very beneficial.

#### *Arthritis*

Severe pain and degenerative changes in the glenohumeral joint should arouse suspicion of calcium pyrophosphate deposition disease (pseudogout), not primary osteoarthritis, which rarely develops in this joint. Mild degenerative changes in the AC and glenohumeral joints are often visible on x-ray films, but they are rarely symptomatic. When more advanced degenerative arthritis of the AC joint does develop, symptoms may appear. A patient usually has local pain over the joint or pain in the anterior part of the shoulder made worse by shrugging or lifting the hands over the head. A physical examination may show a painful arc between 140 and 180 degrees of abduction, much higher than in patients who have inflammation in the rotator cuff tendons. Findings on radiographs usually confirm the presence of degenerative changes in the AC joint. Treatment of AC joint arthritis usually consists of analgesic and nonsteroidal antiinflammatory agents, reduction of stress applied to the shoulder and physical therapy to maintain full range of motion of the shoulder.

#### **Summary**

Clinicians must be aware that on some occasions other important conditions may be responsible for shoulder pain. For example, gallbladder disease or diaphragmatic irritation on the right side may be referred to the upper border of the right scapula. In addition, it should be remembered that the pain of myocardial infarction may be felt most intensely in the region of the left shoulder, usually with some radiation down the inner aspect of the left arm. In most cases a thorough clinical evaluation together with radiographic studies in selected patients will yield the diagnosis and allow a physician to proceed with a rational management plan.

#### **GENERAL REFERENCES**

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